Our starting materials include kaolin, feldspar (sodium and potassium), wollastonite (the main mineral is $CaO.SiO_2$ or CS). CS provide CaO to make CAS_2. In addition, quartz sand (SiO_2) and aluminium oxide (Al_2O_3) were also used to provide oxide for CAS_2. The mixture was finely ground, dried to obtain powder with moisture of about 7 – 8 %. The samples were shaped by semi-dry pressed method. Samples were fired at 1250 ^oC in 10 minutes and 30 minutes. The sintered samples were determined the necessary physical properties such as water absorption, flexural strength, Vicker's hardness, the density and the whiteness. The change during heating were revealed by the differential scaning calorimetry (DSC). CAS_2 minerals were analyzed by means of X-Ray Powder Diffractometry (XRD) and phase idenfitication was performed by X'Pert High Score Plus software. The formation of nanoporous structure was confirmed by SEM. All of analysis results showed an accordance between specifications and structure of product.

2. EXPERIMENTAL

Mixture were prepared in a planetary rapid mill of laboratory. We tested obtained slip by the < 0.5 % residue on the sieve 63 μm. This slip casting were dryed into powder with moisture 7 – 8 %. The powder samples were compressed at pressure of 50 MPa shaping by a rectangular box with length x width x height of 8×2×0.2 (cm). The samples were dried at 110 ^oC and then fired at 1250 ^oC soaking at 10 and 30 minutes with the heating rate 5 ^oC / min.

The chemical composition of materials was determined by type ARL XRF machine-Advantx-2443 (16492) by Thermo Scientific 7. The change during heated process has been studied by DSC (DSC - TG Labsys machine TG / DSC SETARAM). The minerallization process of CAS_2 has been indentified by XRD (Bruker AXS machine A25 D8 Advance GmbH of Karlsruhe, Germany, the voltage: 40 KV, current: 40mA, radiation: Cu-Kα) and the quantitative analysis crystalline phases by X'Pert High Score software-Plus. The micro structure of the products has been studied through microscope images SEM with ×x1000 and ×5000 magnification times (Hitachi S-4800). Whiteness L* of fired samples tested according to CIELAB whiteness scale. XRD, XRF and SEM analysis at nano technology lab- HCMC National University, analyzed DSC - TG at the Department of Chemistry, University of Pedagogy- HCMC, measuring the physical properties of the samples at the laboratory Silicate, Technology University of HCMC.

The software support X'Pert High Score Plus was used to quantitative phase analysis on the paterns of XRD. The crystallization ratio (%) of crystal C is calculated as the ratio of the total area of the peaks on the horizon (S_p) of the total area of the spectrum, including peak area (S_p) and basic space (S_b). On the other hand, peak intensity I_{max} related to volume ratio of the crystalline phase is present [2]. Although I_{max} is not proportional to the volume of crystalline phase, but the change coefficient W_x reflect the changing composition of the crystalline phase having the same form and the same chemical in the same conditions of XRD analysis.

$$C = \frac{S_p}{S_p + S_b}$$

$$W_x = \frac{I_{max_x}}{\sum I_{max_x}} \times C$$